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USA



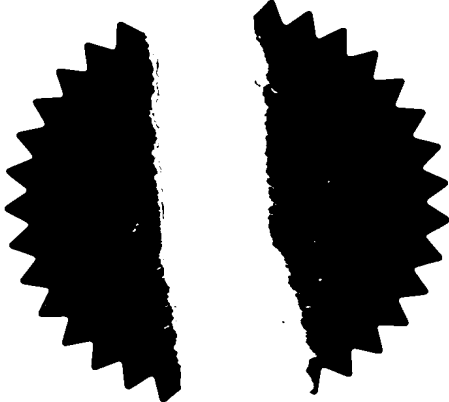
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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein together with the Statement of inventorship and of right to grant of a Patent (Form 7/77), which was subsequently filed.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed

*KAR cheneb*

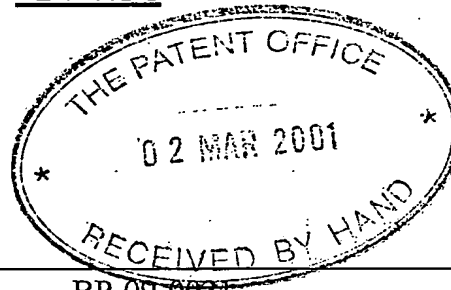
Dated 25 February 2002

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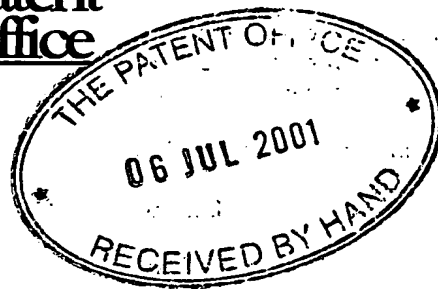
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# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)



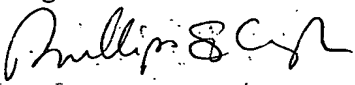
1.	Your reference	BP-09-0021		
2.	Patent application number (The Patent Office will fill in this part)	<div style="text-align: right;">05MAR01 E610795-1 D02826</div> <div style="text-align: right;">P01/7700 0.00-0105307.3</div> <div style="text-align: right;">02 MAR 2001</div> <div style="text-align: center; font-size: 2em; font-weight: bold;">0105307.3</div>		
3.	Full name, address and postcode of the or of each applicant ( <i>underline all surnames</i> )	FMC CORPORATION 200 East Randolph Drive Chicago Illinois 60601 U.S.A. Patents ADP number ( <i>if you know it</i> ) 431 594 1002 If the applicant is a corporate body, give the country/state of its incorporation Delaware, USA		
4.	Title of the invention	DEBRIS CAP		
5.	Name of your agent ( <i>if you have one</i> )	PHILLIPS & LEIGH		
	"Address for service" in the United Kingdom to which all correspondence should be sent ( <i>including the postcode</i> )	5 Pemberton Row London EC4A 3BA		
	Patents ADP number ( <i>if you know it</i> )	0001289001 ✓		
6.	If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and ( <i>if you know it</i> ) the or each application number	Country	Priority application number ( <i>if you know it</i> )	Date of filing (day / month / year)
7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing (day / month / year)	
8.	Is a statement of inventorship and of right to grant of a patent required in support of this request? ( <i>Answer 'Yes' if:</i> a) any applicant named in part 3 is not an inventor, or b) there is an inventor who is not named as an applicant, or c) any named applicant is a corporate body. See note (d))			
	YES			



The Patent Office

Cardiff Road  
Newport  
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# Statement of inventorship and of right to grant of a patent

1.	Your reference	BP-09-0021
2.	Patent application number (if you know it)	GB 01 05307.3
3.	Full name of the or of each applicant	FMC CORPORATION
4.	Title of the invention	DEBRIS CAP
5.	State how the applicant(s) derived the right from the inventor(s) to be granted a patent	By virtue of an Assignment effective 28 <sup>th</sup> February 2001 made between 1) the Inventors; 2) their employer, FMC Corporation (UK) Limited; and 3) the Applicants.
6.	How many, if any, additional Patents Forms 7/77 are attached to this form (see note (c))	1
7.	I/We believe that the person(s) named over the page (and on any extra copies of this form) is/are the inventor(s) of the invention which the above patent application relates to:  Signature  Date 6 <sup>th</sup> July 2001	
8.	Name and daytime telephone number of person to contact in the United Kingdom	Martin Hammler 020 7822 8888

## Notes

- If you need help to fill in this form or you have any questions, please contact the Patent Office on 0645 500505.
- Write your answers in capital letters using black ink or you may type them.
- If there are more than three inventors, please write the names and addresses of the other inventors on the back of another Patents Form 7/77 and attach it to this form.
- When an application does not declare any priority, or declares priority from an earlier UK application, you must provide enough copies of this form so that the Patent Office can send one to each inventor who is not an applicant.
- Once you have filled in the form you must remember to sign and date it.

Enter the full name, address and postcodes of the inventors in the boxes and underline the surnames

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Reminder

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## DEBRIS CAP

### Field of the Invention

This invention relates to debris caps for subsea wellheads and xmas trees.

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### Invention Background

In the exploitation of offshore oilfields, after a well is drilled, it may be left for several months, or even years, before it is completed and placed into production mode ("temporary abandonment"). Similarly, a subsea xmas tree may not be used for  
10 production immediately after it has been installed at the wellhead. In such circumstances there is a need to protect upper external and internal wellhead and subsea xmas tree sealing surfaces, locking profiles and other vulnerable components against corrosion. Protection against damage or obstruction by falling debris, silt and biological accretions is also required.

15

For these purposes a debris cap will be installed on the upper end of the wellhead housing or xmas tree. It is deployed by wireline using a special running tool. A ROV actuated lockdown mechanism is used to secure the cap in place. The ROV is also used to deliver, to the volume of stagnant seawater trapped beneath the cap, via an umbilical connection, a  
20 solution containing corrosion inhibitors and biocides. This provides corrosion protection for the various types of materials within the stagnant volume as required (for example AISI 8630 steels, Inconel<sup>RTM</sup> 718 and 625 alloys, elastomers such as HNBR, PTFE or plastics such as Devlon<sup>RTM</sup> V-API). The biocide will also inhibit bacterial growth.

### 25 Problem to be Solved

Feed back from customers and end users has highlighted certain flaws within the existing design of debris caps. Their installation procedures are relatively complex and time consuming, involving use of the wireline running tool, followed by ROV manipulation of the lockdown mechanism and connection/disconnection of the corrosion inhibitor delivery  
30 umbilical. The complexity can lead to unexpected installation difficulties, still further increasing the required ROV deployment time.

the flange 18 and a central hole 26 in the hood 16 in which the boss 14 is received. The boss 14 contains a T-shaped passageway 28 whose stem communicates with the interior of the hood 16, and whose other ends are provided with inlet 30 and outlet 32 valves, to allow displacement of seawater as the cap 10 is removed from or installed upon the tree 12. Fluid hoses may be connected to the valves 30, 32 to allow flushing of the stagnant volume 50 (including injection of corrosion inhibitor/biocide in the conventional manner) if required. A sacrificial anode 34 is attached to the boss 14, to provide electrolytic protection for the cap 10. A perforated container 36 is bolted to the boss 14 within the hood 16. Prior to running the cap 10, the container is charged with a solid block of corrosion inhibitor and/or biocide (not shown). This may be wrapped in water soluble membrane bags which dissolve sequentially in use, to release the corrosion inhibitor/biocide over an extended period. The stagnant volume is therefore kept sanitised, protecting the surrounding materials against corrosion and bacterial activity for a number of years, if needed. The biocide blocks can be constructed and formulated having regard to the volume/surface areas to be kept sanitised and the anticipated abandonment time. For example the block may weigh between 25g and 25kg, and may comprise Blairchem B220 solid biocide, available from Blairchem Limited, Karibu, Blairs, Aberdeen, AB12 5YT, Scotland. The upper end of the boss 14 carries a lifting eye 38 for engagement by a ROV tool or wireline. The hood is provided with a handle 40, a flared skirt 44 for guiding it into engagement with the tree 10 upper end, and an inner circumferential O ring seal 42. This environmental seal 42 not only seals the cap 10 against the tree outer circumference, but also frictionally engages the tree 12 and, together with the suction effect of the substantially sealed internal volume 50, helps to keep the cap 10 in place. No additional lockdown mechanism is required, greatly simplifying installation procedures. Use of a pre-fitted solid biocide block also eliminates the need to inject biocide/corrosion inhibitor via an umbilical. The cap 10 is therefore relatively simple to install or remove, by wireline, ROV or diver.

Figure 3 shows a second embodiment of the debris cap 10, formed from a single injection moulding of e.g. Devlon<sup>RTM</sup> V or other suitable plastics material. The lower end and skirt 44 of the cap 10 are divided into a number of axially extending fingers 46, which

**CLAIMS**

1. A debris cap for a subsea xmas tree or wellhead, comprising a container that can be pre-charged with corrosion inhibitor and/or biocide prior to installation subsea, and  
5 which releases the corrosion inhibitor/biocide into a stagnant volume enclosed beneath the cap following installation.
2. A debris cap as defined in claim 1 and which is frictionally retained on the tree or wellhead in use, without the use of a lockdown mechanism.
- 10 3. A debris cap as defined in claim 1 or 2, comprising an O ring environmental seal.
4. A debris cap as defined in claim 1, 2 or 3, comprising a perforated container for holding a solid block of corrosion inhibitor and/or biocide.
- 15 5. A debris cap as defined in claim 1, 2 or 3, comprising a wire basket for holding a solid block of corrosion inhibitor and/or biocide.
6. A debris cap as defined in any preceding claim, comprising a finger for frictionally  
20 gripping the tree or wellhead.
7. A debris cap as defined in any preceding claim, comprising a valve allowing water displacement during cap installation or retrieval.
- 25 8. A debris cap as defined in any preceding claim, comprising a central boss and a surrounding hood.
9. A debris cap as defined in any preceding claim, moulded from plastics material.
- 30 10. A debris cap for a subsea xmas tree or wellhead, substantially as described with reference to or as shown in Figures 1 and 2 or Figures 3 and 4 of the drawings.

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Fig. 1

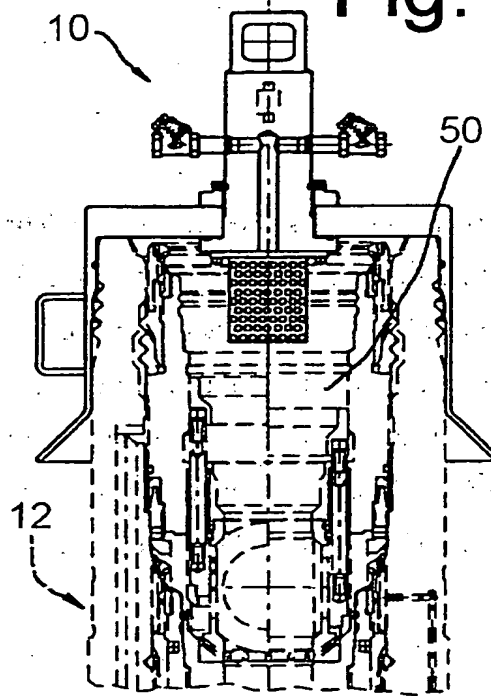
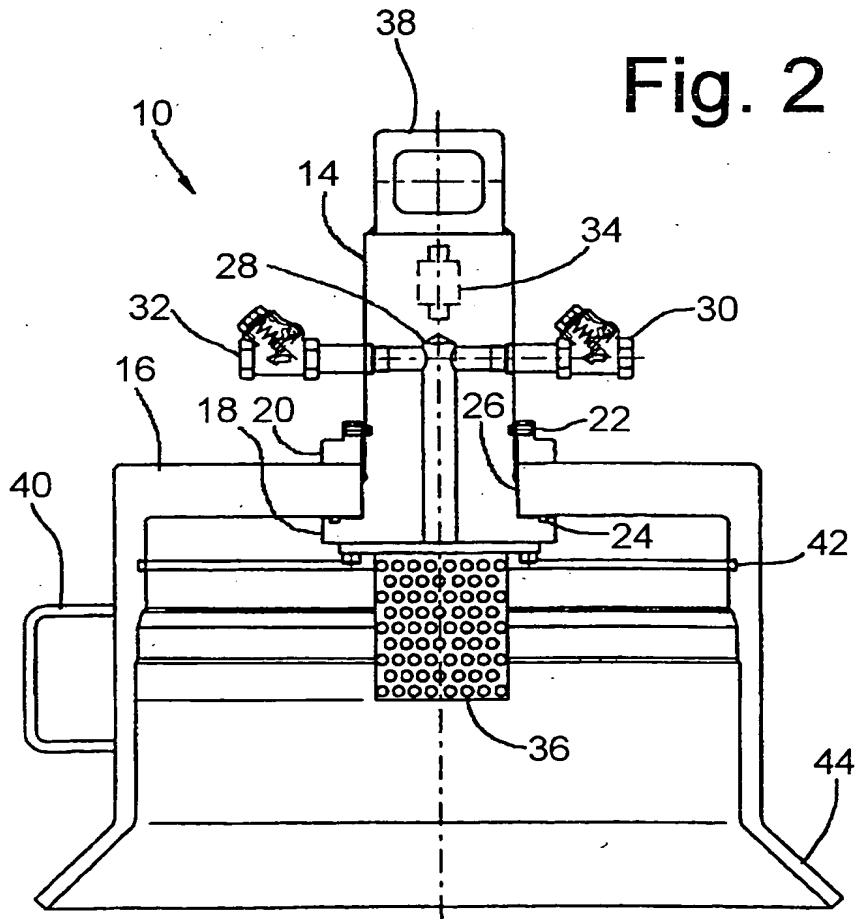


Fig. 2





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Fig. 3

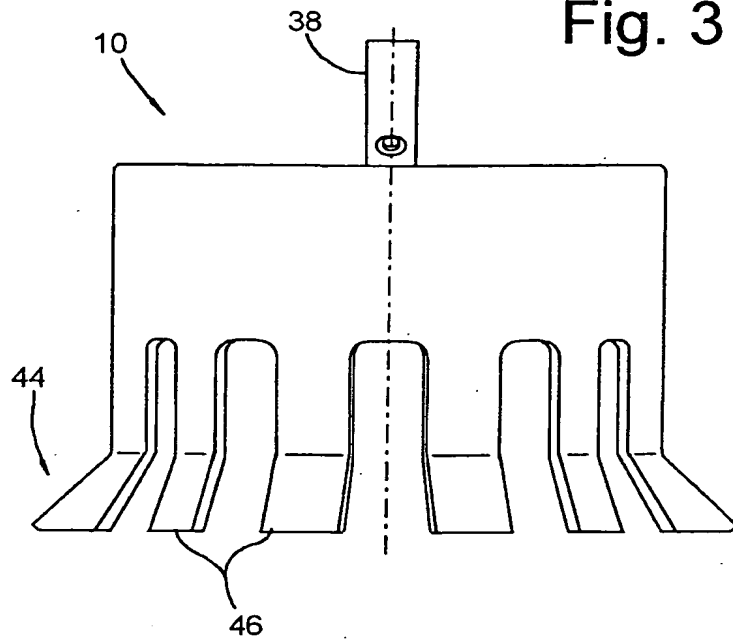


Fig. 4

